

Regional Supervisor, Division of Wildlife Refuges
Twin Cities, Minnesota

March 15, 1972

Regional Engineer, Division of Engineering
Twin Cities, Minnesota

EN-H-R-Tewaukon
Annual Water Program

Tewaukon National Wildlife Refuge Annual Water Program

We have reviewed and concur in the subject program.

The written summary of the past year water management gives an excellent explanation of how the water was used on the refuge. But we note that the outflow from Pool #1 was not recorded during the past year. It is important that the outflow data be recorded as it occurs and a summary of this data be provided in tabular form and included in the annual water program report.

The manager appears to be handling the seepage problem involving the Nickerson land and Pool #3, in the best manner possible under present conditions. Hopefully we will obtain the necessary funds to remedy this situation in the near future.

Please advise us concerning the Storm Lake Easement Refuge, if you desire engineering assistance this year.

The report on easement refuges "left-out" comments on the Maple River Refuge this year, apparently this structure is still functioning satisfactorily.

The manager should prepare location maps for the newly flooded potholes adjacent to Sprague Lake and send a copy to us for our files. The report forms described on pages D-3a, D-3b, and D-3c of the Wetland Management Guidelines would serve this purpose well.

The manager should be advised that this type of development is not permissible without first clearing with the Regional Office and, without having a determination as to whether or not an Environmental Impact Statement has to be prepared. (See pages 8 and 15 and photos 8 to 12.) This type of development work must also be approved in accordance with 23AMO, Appendix A, Subpart 14D-4, 7028 (c) prior to construction.

John D. Umberger

cc: Refuges, R.O.

SCBrashears:kd / STEPHAN

Stephan
3/15/72

Burkman
3-15-72

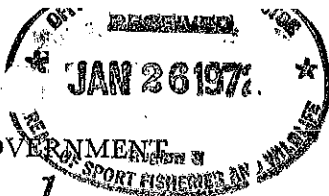
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UNITED STATES GOVERNMENT

Memorandum



Carl Stephan

TO : Regional Director, BSF&W, Twin Cities, Minn.

DATE: January 25, 1972

FROM : Refuge Manager, Tewaukon Refuge
Cayuga, North Dakota

(RF)

SUBJECT: 1972 Water Program and 1971 Water Use Data

Attached are two copies of the 1972 water program and 1971 water use data for the refuge.

A short summary on easement refuges administered from Tewaukon is included in the reports.

Two copies of U.S. Geological Survey streamflow records for the Cayuga and Rutland gauging stations are also attached.

Ernest A. Alfstad
for Herbert G. Troester

Attachment

*Photos are filed
in the ~~14~~ Photo Album
for Tewaukon
Clet
7-5-72*



ANNUAL WATER PROGRAM - TEWAUKON REFUGE

I. 1971 Water Use DataIMPOUNDMENT DATAPool 1, Lake Tewaukon for Calendar Year 1971

| Month | Minimum | | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|---|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1146.15 | 1185 | 7350 | : | *1146.15 | 1185 | 7350 |
| Feb. | *1146.15 | 1185 | 7350 | : | *1146.15 | 1185 | 7350 |
| Mar. | *1146.15 | 1185 | 7350 | : | *1146.90 | 1235 | 8200 |
| Apr. | 1146.80 | 1230 | 8100 | : | 1146.90 | 1235 | 8200 |
| May | 1146.75 | 1225 | 8050 | : | 1146.80 | 1230 | 8100 |
| June | 1146.80 | 1230 | 8100 | : | 1147.20 | 1253 | 8610 |
| July | 1147.00 | 1240 | 8350 | : | 1147.20 | 1253 | 8610 |
| Aug. | 1146.70 | 1224 | 8000 | : | 1147.00 | 1240 | 8350 |
| Sept. | 1146.50 | 1210 | 7750 | : | 1146.70 | 1224 | 8000 |
| Oct. | 1146.40 | 1204 | 7620 | : | 1146.50 | 1210 | 7750 |
| Nov. | 1146.40 | 1204 | 7620 | : | *1146.60 | 1220 | 7900 |
| Dec. | *1146.60 | 1220 | 7900 | : | *1146.60 | 1220 | 7900 |

Pool 2, Cutler's Marsh for Calendar Year 1971

| Month | Minimum | | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|---|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1149.50 | 210 | 518 | : | *1149.50 | 210 | 518 |
| Feb. | *1149.50 | 210 | 518 | : | *1149.50 | 210 | 518 |
| Mar. | *1149.50 | 210 | 518 | : | *1150.20 | 231 | 640 |
| Apr. | 1150.20 | 231 | 640 | : | 1150.90 | 250 | 785 |
| May | 1150.70 | 244 | 740 | : | 1150.90 | 250 | 785 |
| June | 1150.70 | 244 | 740 | : | 1150.90 | 250 | 785 |
| July | 1150.40 | 238 | 719 | : | 1150.90 | 250 | 785 |
| Aug. | 1150.20 | 231 | 640 | : | 1151.00 | 252 | 810 |
| Sept. | 1150.90 | 250 | 785 | : | 1151.00 | 252 | 810 |
| Oct. | 1150.90 | 250 | 785 | : | 1151.00 | 252 | 810 |
| Nov. | 1151.00 | 252 | 810 | : | *1151.30 | 261 | 890 |
| Dec. | *1151.30 | 261 | 890 | : | *1151.30 | 261 | 890 |

Pool 3, Maka Pool for Calendar Year 1971

| Month | Minimum | | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|---|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1151.70 | 85 | 180 | : | *1151.70 | 85 | 180 |
| Feb. | *1151.70 | 85 | 180 | : | *1151.70 | 85 | 180 |
| Mar. | *1151.70 | 85 | 180 | : | 1155.80 | 122 | 590 |
| Apr. | 1155.80 | 122 | 590 | : | 1155.90 | 123 | 602 |
| May | 1155.90 | 123 | 602 | : | 1155.90 | 123 | 602 |
| June | 1155.80 | 122 | 590 | : | 1155.90 | 123 | 602 |
| July | 1155.40 | 120 | 542 | : | 1155.80 | 122 | 590 |
| Aug. | 1152.65 | 107 | 230 | : | 1155.40 | 120 | 542 |
| Sept. | 1150.80 | 33 | 80 | : | 1152.65 | 107 | 230 |
| Oct. | 1150.70 | 33 | 75 | : | 1150.80 | 33 | 80 |
| Nov. | 1150.70 | 33 | 75 | : | *1150.80 | 33 | 80 |
| Dec. | *1150.80 | 33 | 80 | : | *1150.80 | 33 | 80 |

*Reading, top of ice.

Pool 4 for Calendar Year 1971

| Month | Minimum | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | dry | - | - | dry | - | - |
| Feb. | dry | - | - | dry | - | - |
| Mar. | dry | - | - | 1159.00 | 94 | 261 |
| Apr. | 1158.60 | 83 | 240 | 1158.90 | 91 | 256 |
| May | 1158.40 | 77 | 230 | 1158.60 | 83 | 240 |
| June | 1158.40 | 77 | 230 | 1158.70 | 86 | 265 |
| July | 1158.20 | 72 | 217 | 1158.70 | 86 | 265 |
| Aug. | 1157.50 | 58 | 185 | 1158.20 | 72 | 217 |
| Sept. | 1157.00 | 47 | 165 | 1157.50 | 58 | 185 |
| Oct. | 1157.00 | 47 | 165 | 1157.10 | 50 | 168 |
| Nov. | 1157.10 | 50 | 168 | *1157.25 | 53 | 175 |
| Dec. | *1157.25 | 53 | 175 | *1157.25 | 53 | 175 |

Pool 8, Hepi Lake for Calendar Year 1971

| Month | Minimum | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1176.10 | 107 | 415 | *1176.10 | 107 | 415 |
| Feb. | *1176.10 | 107 | 415 | *1176.10 | 107 | 415 |
| Mar. | *1176.10 | 107 | 415 | 1177.97 | 109 | 620 |
| Apr. | 1175.30 | 106 | 332 | 1177.97 | 109 | 620 |
| May | 1174.95 | 105 | 300 | 1175.30 | 106 | 332 |
| June | 1174.95 | 105 | 300 | 1175.30 | 106 | 332 |
| July | 1175.00 | 105 | 302 | 1175.30 | 106 | 332 |
| Aug. | 1174.60 | 102 | 263 | 1175.00 | 105 | 302 |
| Sept. | 1174.25 | 96 | 230 | 1174.60 | 102 | 263 |
| Oct. | 1174.25 | 96 | 230 | 1174.35 | 98 | 240 |
| Nov. | 1174.35 | 98 | 240 | *1174.50 | 101 | 250 |
| Dec. | *1174.50 | 101 | 250 | *1174.50 | 101 | 250 |

Pool 11, West White Lake for Calendar Year

| Month | Minimum | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1147.40 | 35 | 61 | *1147.40 | 35 | 61 |
| Feb. | *1147.40 | 35 | 61 | *1147.40 | 35 | 61 |
| Mar. | *1147.40 | 35 | 61 | 1148.25 | 46 | 80 |
| Apr. | 1148.00 | 42 | 67 | 1148.25 | 46 | 80 |
| May | 1148.00 | 42 | 67 | 1149.70 | 64 | 161 |
| June | 1149.70 | 64 | 161 | 1150.50 | 72 | 213 |
| July | 1150.00 | 67 | 179 | 1150.50 | 72 | 213 |
| Aug. | 1149.60 | 63 | 151 | 1150.00 | 67 | 179 |
| Sept. | 1149.60 | 63 | 151 | 1150.00 | 67 | 179 |
| Oct. | 1150.00 | 67 | 179 | 1150.00 | 67 | 179 |
| Nov. | 1150.00 | 67 | 179 | *1150.10 | 68 | 187 |
| Dec. | *1150.10 | 68 | 187 | *1150.10 | 68 | 187 |

*Reading, top of ice.

Pool 12, East White Lake for Calendar Year 1971

| Month | Minimum | | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|---|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1147.50 | 101 | 350 | ' | *1147.50 | 101 | 350 |
| Feb. | *1147.50 | 101 | 350 | ' | *1147.50 | 101 | 350 |
| March | *1147.50 | 101 | 350 | ' | *1147.75 | 102 | 375 |
| Apr. | 1147.58 | 101 | 360 | ' | 1147.75 | 102 | 375 |
| May | 1147.00 | 100 | 300 | ' | 1147.58 | 101 | 360 |
| June | 1147.00 | 100 | 300 | ' | 1147.20 | 100 | 320 |
| July | 1147.00 | 100 | 300 | ' | 1147.20 | 100 | 320 |
| Aug. | 1146.90 | 99 | 290 | ' | 1147.00 | 100 | 300 |
| Sept. | 1146.80 | 97 | 280 | ' | 1146.90 | 99 | 290 |
| Oct. | 1146.70 | 96 | 270 | ' | 1146.80 | 97 | 280 |
| Nov. | 1146.70 | 96 | 270 | ' | *1146.85 | 98 | 285 |
| Dec. | *1146.85 | 98 | 285 | ' | *1146.85 | 98 | 285 |

Pool 13, Mann Lake for Calendar Year 1971

| Month | Minimum | | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|---|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1207.25 | 37 | 125 | ' | *1207.25 | 37 | 125 |
| Feb. | *1207.25 | 37 | 125 | ' | *1207.25 | 37 | 125 |
| Mar. | *1207.25 | 37 | 125 | ' | *1209.80 | 51 | 240 |
| Apr. | 1209.10 | 48 | 210 | ' | 1209.80 | 51 | 240 |
| May | 1208.58 | 45 | 186 | ' | 1209.10 | 48 | 210 |
| June | 1208.58 | 45 | 186 | ' | 1208.75 | 46 | 189 |
| July | 1208.40 | 44 | 175 | ' | 1208.75 | 46 | 189 |
| Aug. | 1207.60 | 40 | 138 | ' | 1208.40 | 44 | 175 |
| Sept. | 1207.35 | 38 | 125 | ' | 1207.60 | 40 | 138 |
| Oct. | 1207.35 | 38 | 125 | ' | 1207.35 | 38 | 125 |
| Nov. | 1207.35 | 38 | 125 | ' | *1207.50 | 39 | 133 |
| Dec. | *1207.50 | 39 | 133 | ' | *1207.50 | 39 | 133 |

Pool 14, Sprague Lake for Calendar Year 1971

| Month | Minimum | | | | Maximum | | |
|-------|----------------------|-----------------|----------------------|---|----------------------|-----------------|----------------------|
| | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) | | Elevation Ft.-msl | Area (acres) | Capacity (ac.-ft) |
| Jan. | *1210.30 | 163 | 687 | ' | *1210.30 | 163 | 687 |
| Feb. | *1210.30 | 163 | 687 | ' | *1210.30 | 163 | 687 |
| Mar. | *1210.30 | 163 | 687 | ' | *1212.80 | 185 | 1167 |
| Apr. | 1212.60 | 182 | 1140 | ' | 1212.80 | 185 | 1167 |
| May | 1212.30 | 181 | 1094 | ' | 1212.60 | 182 | 1140 |
| June | 1212.30 | 181 | 1094 | ' | 1212.90 | 186 | 1183 |
| July | 1212.50 | 182 | 1124 | ' | 1212.90 | 186 | 1183 |
| Aug. | 1211.80 | 178 | 1020 | ' | 1212.50 | 183 | 1124 |
| Sept. | 1211.50 | 176 | 975 | ' | 1211.80 | 178 | 1020 |
| Oct. | 1211.50 | 176 | 975 | ' | 1211.55 | 176 | 982 |
| Nov. | 1211.55 | 176 | 982 | ' | *1211.70 | 177 | 1005 |
| Dec. | *1211.70 | 177 | 1005 | ' | *1211.70 | 177 | 1005 |

*Reading, top of ice.

Small Impoundments, 1971 (Hepi Lake Drainage)
(Minimum Monthly Elevation)

| Month | Pool 2A | Pool 3A | Pool 5 | Pool 6 | Pool 7 | Pool 7A |
|-------|----------|----------|----------|----------|----------|---------|
| Jan. | *1150.65 | *1154.44 | dry | dry | *1171.45 | dry |
| Feb. | *1150.65 | *1154.44 | dry | dry | *1171.45 | dry |
| Mar. | *1150.65 | *1154.44 | dry | dry | *1171.45 | dry |
| Apr. | *1151.00 | *1155.60 | 1159.40 | dry | 1172.10 | (1) |
| May | 1153.75 | 1156.10 | 1162.64 | 1165.00 | 1172.90 | (1) |
| June | 1152.86 | 1156.10 | 1161.40 | 1168.61 | 1172.80 | (1) |
| July | 1152.11 | 1156.10 | 1160.55 | 1168.20 | 1172.40 | (1) |
| Aug. | 1151.80 | 1154.80 | 1160.00 | 1167.60 | 1171.80 | dry |
| Sept. | 1151.70 | 1154.60 | 1159.40 | 1167.28 | 1171.40 | dry |
| Oct. | 1151.70 | 1154.60 | 1159.40 | 1167.20 | 1171.40 | dry |
| Nov. | 1151.80 | 1154.70 | 1159.45 | 1167.20 | 1171.50 | dry |
| Dec. | *1151.86 | *1154.80 | *1159.55 | *1167.44 | *1171.70 | dry |

(Maximum Monthly Elevation)

| Month | Pool 2A | Pool 3A | Pool 5 | Pool 6 | Pool 7 | Pool 7A |
|-------|----------|----------|----------|----------|----------|---------|
| Jan. | *1150.65 | *1154.44 | dry | dry | *1171.45 | dry |
| Feb. | *1150.65 | *1154.44 | dry | dry | *1171.45 | dry |
| Mar. | *1151.00 | *1155.60 | 1159.40 | 1167.00 | 1172.10 | (1) |
| Apr. | 1153.75 | 1156.45 | 1163.00 | 1166.50 | 1173.00 | (1) |
| May | 1153.75 | 1156.45 | 1163.00 | 1168.85 | 1173.00 | (1) |
| June | 1153.75 | 1156.77 | 1162.64 | 1168.85 | 1172.90 | (1) |
| July | 1152.86 | 1156.77 | 1161.40 | 1168.61 | 1172.80 | (1) |
| Aug. | 1152.11 | 1156.10 | 1160.55 | 1168.20 | 1172.40 | dry |
| Sept. | 1151.80 | 1154.80 | 1160.00 | 1167.60 | 1171.80 | dry |
| Oct. | 1151.80 | 1154.70 | 1159.45 | 1167.28 | 1171.50 | dry |
| Nov. | *1151.86 | *1154.80 | *1159.55 | *1167.44 | *1171.70 | dry |
| Dec. | *1151.86 | *1154.80 | *1159.55 | *1167.44 | *1171.70 | dry |

*Reading, top of ice. (1) Partly full (about two feet of water in pool.)

Tewaukon Refuge, Consumptive Water Use For 1971

| Pool | A Avg. Annual Evap. | B 1971 Lake Rise | C Net Gain A+B | D Surface Acres | E Ac-Ft Gain CxD | F Outflow in Ac-Ft | G Total Inflow Ac-Ft E+F |
|------|------------------------------|---------------------------|-------------------------|-----------------------|---------------------------|-----------------------------|-----------------------------------|
| 16 | 2.65' | -.70 | 1.95 | 80 | 156 | 0 | ** |
| 14 | 2.65' | +1.25 | 3.90 | 181 | 706 | Unk | " |
| 13 | 2.65' | +.25 | 2.90 | 44 | 128 | " | " |
| 12 | 2.65' | -.65 | 2.00 | 99 | 198 | " | " |
| 11 | 2.65' | +2.70 | 5.35 | 62 | 332 | " | " |
| 10 | 2.65' | -1.00 | 1.65 | 6 | 10 | 0 | " |
| 9 | 2.65' | -2.00 | .65 | 8 | 5 | 0 | " |
| 8 | 2.65' | -1.60 | 1.05 | 103 | 108 | Unk | " |
| 7A | 2.65' | .00 | 2.65 | 4 | 11 | " | " |
| 7 | 2.65' | +.25 | 2.90 | 16 | 46 | " | " |
| 6 | 2.65' | +4.44 | 7.09 | 7 | 50 | " | " |
| 5 | 2.65' | +4.15 | 6.80 | 8 | 54 | " | " |
| 4 | 2.65' | +5.75 | 8.40 | 71 | 596 | " | " |
| 3A | 2.65' | +.36 | 3.01 | 6 | 18 | " | " |
| 3 | 2.65' | -.90 | 1.75 | 101 | 177 | " | " |
| 2A | 2.65' | +1.21 | 3.86 | 18 | 69 | " | " |
| 2 | 2.65' | +1.80 | 4.45 | 246 | 1095 | " | " |
| 1 | 2.65' | +.45 | 3.10 | 1229 | 3810 | 0* | 3810 |

* No outflow recorded from pool. The Cayuga gauging station however recorded 560 ac-ft runoff from between Dam 1 and station. ** Not calculated.

SUMMARY OF 1971 WATER PROGRAM

Winter Conditions

It was a relatively open winter with little snow cover until the first week of February when we received 3" of snow giving us a total of 10" on the ground. Mild weather during the last half of February left little snow remaining except in sheltered areas. The smaller watershed dams south of the Sprague Lake Unit filled during the last week in February. We had hoped for snow during March to add water to the potholes but only .07" of precipitation was recorded during the month. Only 12" of snow was recorded for the January through March period.

Spring Runoff

Wild Rice River Watershed

Spring runoff was at a minimum because of lack of snow. Daytime temperatures climbed to the 40's and 50's during March 11th through 17th, melting what snow remained in the watershed. Mann Lake gained 2.5' in elevation during March to a peak spring reading of 1209.80. Sprague Lake also rose 2.5' (to 1212.80) from water flowing into it from the T-1A Watershed Dam south of the lake. Runoff received from T-1A Watershed Dam had all but ended by March 22nd. Mann Lake had receded .7' by the end of April with Sprague Lake dropping only .2'.

Pool 4 was dry over winter. It filled by March 14th when water started going over the stoplogs. Only 24.2 cfs was recorded during the greatest outflow which occurred on March 17th. Outflow from Pool 4 had ended by the first week in May. Pool 3 was full by the end of March, gaining about 4' in elevation to a high of 1155.80 by the end of the month. Outflow was recorded from the pool until the end of April. Pool 2 reached a peak spring elevation on April 30th from water coming in from Pool 3 and no outflow was recorded into Lake Tewaukon from Pool 2.

The watershed southeast of Lake Tewaukon began flowing by March 12th and water was observed going over the road south of Skroch's Bay on the 14th. This runoff was short-lived however, and had slowed to a trickle by the 22nd. Tewaukon rose .75' during March to a peak spring reading of 1146.90. No outflow was recorded from Tewaukon during the spring, summer or fall. The larger pools were ice free by April 9th, the same date as last year.

White Lake Watershed

The water levels in East and West White Lakes were generally stable during spring runoff. East White Lake gained .25' during the spring and West White Lake gained .85' from local runoff southwest of the lake.

Hepi Lake Watershed

Water flowing out of T-2 Watershed Dam had reached Hepi Lake by March 12th. The lake rose 1.9' to 1177.97, its peak reading, by March 29th. The control gate was opened 14" on Hepi Lake on the 29th to fill the downstream pools. T-2 had quit running by the end of March. The control gate on Pool 7A was opened on April 1st to allow water to pass to other downstream pools.

Pool 7 had filled to 1173.0 by the end of April, 1.5' higher than its winter reading. Pool 6 developed a leak next to the CMP during the spring and leaked dry by mid-April. Repairs were made to the dike with an anti-seep collar poured around the tube. Pool 6 was refilled in May.

Pool 5 had filled to 1163.0 by April 30th from the leaking Pool 6. Two feet of water was added to Pool 3A during the spring bringing its elevation up to 1156.45 by April 30th. Pool 2A had also filled by April 30th.

Summer and Fall Conditions

Wild Rice River Watershed

Little fluctuation was noted in any of the pools during the summer months (other than those in planned drawdown) although enough runoff was received from rains in late June to start the river flowing again. By mid-July it had quit running, however.

Mann Lake rose .17' from the June rains bringing its elevation to 1208.75 on June 30th. By the end of August it was at 1207.60. Going into winter it read 1207.50, .25' higher than a year ago.

A 4" cloudburst in the hills south of Sprague Lake on June 29th filled T-1A and added water to Sprague Lake sending the lake elevation to 1212.90 on June 30th, its high reading for the year. Water ran into Mann Lake during this period. At freeze-up Sprague Lake was at 1211.70, over a foot higher than last year. Sprague Lake continued to provide good fishing for northerns both this summer and early winter. A beaver has a cache on the south shore of the lake this winter.

Except for June when the pool raised .4', Pool 4 dropped at the rate of about one-half foot per month during the summer. At freeze-up the elevation was 1157.25. It was dry last winter.

Pool 3 continued to seep onto Ed Nickeson's land even though we raised and widened the dike separating the pool from Nickeson's lake bottom. The core of the old dike is so undermined with muskrat runs that an effective seal is impossible unless we were to rebuild the core of the dike which limited funds and manpower won't allow. We drew Pool 3 down in August to stop the seepage and add water to Pool 2 to allow for muskrat use in the heavy growth of cattail in the upper end of the pool. By fall Pool 3 held water only in the river channel and Mud Slough with its elevation at 1150.80, 2.8' above outlet bottom.

Pool 2 held at 1150.80+- after spring runoff. When the stoplogs were pulled on Pool 3, Pool 2 gained .8' in elevation to 1151.00. Fall rains and additional runoff from Pool 3 brought Pool 2 up to 1151.30 at freeze-up. A beaver lodge is located in the upper end of the pool.

The water level in Pool 1 held at 1146.80 after spring runoff. Run-off from heavy June rains in the hills southeast of the lake added .4' to the lake's elevation. Lake Tewaukon was at 1146.60 at freeze-up which is .45' higher than last year. Fishing was fair during the spring and excellent winter fishing for northerns is the case this winter. Water quality was poor with a large blue-green algae bloom in July. The lake had cleared up by fall, however. Lake Tewaukon was froze over by November 30th, except at the "Point" and towards the east end where mallards were keeping the water open. Most smaller impoundments were frozen over by November 6th. The ice on Lake Tewaukon was only 8" to 12" deep at the end of the year.

White Lake Watershed

East and West White Lakes were at 1147.58 and 1148.00, respectively, after spring runoff. We began pumping East White Lake into West White Lake on May 7th, adding 1.7' of water to the west side by the end of May. Pumping continued in June bringing West White Lake up to 1150.50 by June 30th. We discontinued pumping during the summer months but resumed it this fall, beginning on September 2nd. At freeze-up West White Lake was at 1150.10. We had dropped the east side to 1146.85 by freeze-up. We weren't able to pump it dry because of the "dished" shape of the pool. A check this winter showed the lake to be about one foot deep. It should dry up in 1972 unless we get a large amount of runoff from snow or rain. Many clams were observed along the shoreline as the pool was dewatered. Some seepage is occurring through the Pool 11 dike into Pool 12.

Hepi Lake Watershed

Water was allowed to flow from Hepi Lake to fill the downstream pools until the water in Hepi Lake stopped running. Heavy rains in June added water to the lake from T-2 dam bringing Hepi Lake's elevation up enough to allow water to run into Pool 7A. The lake was only about 3 to 4 feet deep at freeze-up, its reading was 1174.50. The channel downstream of Hepi Lake has silted in over the years. If Hepi Lake fills in 1972 we will fully open the control gate and attempt to wash some of the silt out.

Pool 7A held about 2' of water this summer. More would have been added from Hepi Lake but the water level there was below the outlet. Pool 7A will be farmed in 1972 so was dried up this fall.

Pool 7 held at 1172+ most of the summer, dropping to 1171.70 at freeze-up. Pool 6 leaked dry in the spring but was refilled in May. By fall it read 1167.44.

Pool 5 dropped about 3' during the summer and fall with minor leaks between the stoplogs which were finally plugged. It was at 1159.55 at freeze-up.

The dike on Pool 3A developed a leak in August dropping the pool 1.3' during the month, to 1154.80. It was still at 1154.80 at freeze-up, however. Water leaking from Pool 5 helped to maintain the pool.

The dense growth of cattail in Pools 3A and 2A were aerial sprayed with Dalapon this fall with a good kill evident. Pool 2A was at 1151.86 at freeze-up.

Potholes

All but the larger potholes had dried up during the fall of 1970. With no runoff to speak of in the spring of 1971 the water levels in potholes were the worst in years. As an example of the dry winter period, only .07" precipitation was recorded from February 5th through April 26th. Rains in June helped to maintain what little water remained but hot, windy weather in August left most potholes dry. The Sargent County brood route was run August 11th with only 26 out of a total of 79 Type IV and V potholes holding water. And, some of these held only a few inches. Rains this fall helped to soak up the dry pothole basins so, providing we get runoff in 1972, potholes should have water again.

Most dry potholes "grassed in" during the summer and should be very productive of invertebrates should they be flooded next spring.

Control gates were constructed on two potholes, one south and the other west of Sprague Lake. Water can now be added to the potholes from Sprague Lake to help maintain their elevations. As it was, before the pools would fill when Sprague Lake was high in the spring, but then as the lake receded, water would run back out of the potholes. Rocked fish barriers were constructed in the channels leading to the two potholes to help prevent rough fish from entering.

Food, Cover and Wildlife Use

Pool 1 was barren of emergent vegetation but had a fair growth of sago this year. In boating around the shoreline the heaviest growth of sago was on the north side of the lake. Skroch's Bay supported a good sago growth and 3 broods were observed on the pool during the summer. No emergent vegetation was evident in the bay. It will freeze out this winter. About 150,000 gulls spent nights on Tewaukon in September.

The heavy growth of cattail in the upper end of Pool 2 with broken down trees and interspersed again made it attractive to moulting ducks. The pool had a fair sago pondweed growth and was used during the fall migration for watering and resting. Herons and bitterns made good use of the pool. A few broods were observed in the upper end. Wood ducks concentrated in the south end of Pool 2 with 148 counted there in September.

Pool 3 was also used by moulting ducks and received good brood use. It is interspersed well with cattail and bulrushes. The pool was put in draw down in August and shorebirds made extensive use of the exposed mudflats. Pelicans moved in to clean up the fish that were trapped in the lowering waters.

Pool 4 had excellent brood use this year. American egrets preferred this pool to others. A variety of shorebirds used the exposed mudflats in the upper end of the pool in September.

Pool 2A was choked with cattail and was sprayed with Dalapon in September. Moulting ducks used this pool and a number of coots used the dense stand of cattail for nesting. A good kill of cattail resulted from the spraying.

Pool 3A was also sprayed with Dalapon as the upper end is dense with cattail. Coots were numerous here, too.

Pools 5 and 6 had little brood use this year, with only one brood seen on Pool 6 and a couple on Pool 5. Pool 5 was used as a staging area by mallards in August with about 250 present on the pool.

Pool 7 had a good pondweed growth and cattail and bulrush are present in the upper end. Divers made good use of this pool during the fall migration.

Pool 7A held little water during the summer but when flooded early this spring supported 4,000 ducks for about a week, before other pools opened up.

Pool 8 was barren of emergent vegetation, but had excellent growths of sago and was rich in aquatic life. Even though there was no escape cover, a total of 9 broods were counted on the pool one evening in August. This is the best brood use the pool has had for many years. Both dabblers and divers made extensive use of the pool during the fall migration.

Pools 9 and 10 had little brood use this year. No broods were seen on Pool 10. Pool 9 dried up in August. Shorebirds used Pool 9 as it was drying.

Pool 11 received considerable use by coots and redheads during the summer. Many mallards used it this fall. Water from Pool 12 was pumped into Pool 11 during the summer, flooding new areas, which attracted waterfowl and other water birds. The east end, which is quite open, produced sago beds.

Pool 12 (which we were pumping to Pool 11) received good use by pelicans that fished the lake as it was being dried up. Sago was present in the pool. Waterfowl used the lake this fall as a resting and watering area.

Pool 13 is full of carp and bullheads. However, three broods were seen in the upper end of the pool. Migrating waterfowl used the pool for watering and resting during the fall.

Pool 14 is also quite barren of vegetation and was used mainly by fall migrant waterfowl.

Pool 16 (Anderson-Hoistad Unit) north of Mann Lake received excellent waterfowl use this spring and summer with a number of broods observed there. Redheads and canvasbacks used the area during the fall migration. It has good interspersions with pondweed growths.

January 22, 1972

E. Alfstad, Clerk

1971 Easement Refuge Water Use - Tewaukon District

Few checks were made of easement refuges this summer.

The water level of Lake Elsie Refuge this fall was .15' lower than a year ago.

Water conditions in Storm Lake were somewhat lower than last year.

There was little flow of water through the Wild Rice River Refuge this summer as no water ran out of Dam 1, upstream of the refuge. A beaver dam was present on the refuge which held some water back.

Easement Refuges, Consumptive Water Use for 1971

| Refuge | A Avg. Annual Evap. | B 1971 Lake Rise | C Net Gain A+B | D Surface Acres | E Ac-Ft Gain CxD | F Outflow in . Ac-Ft | Total Inflow Ac-Ft E+F |
|------------|------------------------------|---------------------------|-------------------------|-----------------------|---------------------------|-------------------------------|------------------------------|
| Lake Elsie | 2.65' | -.15 | 2.50 | 318 | 795 | Unk. | Unk. |
| Storm Lake | 2.65' | -.20* | 2.45 | 181 | 443 | Unk. | Unk. |
| Wild Rice | 2.65' | +1.00* | 3.65 | 4 | 15 | 560 | 575 |

*These are estimated figures.

Physical Condition of Control Structures

Lake Elsie Refuge

There are no control structures on this area.

Storm Lake Refuge

Last year several residents of Milnor asked about improving Storm Lake. They would like to see waterfowl use the lake again. The city dump on the south shore has now been discontinued. We have not had time to check the flow line of the inlet ditch to determine if we could attempt water management on Storm Lake. Perhaps we should ask for engineering assistance on this.

Wild Rice River Refuge

No control structures, beaver impoundment only.

1972 ANNUAL WATER PROGRAM

The Water Program is described for the Tewaukon Unit and for the Sprague Lake Unit. The Tewaukon Unit is described according to water source: Wild Rice River, Direct; White Lake Watershed; and Hepi Lake Watershed.

Tewaukon Unit

I. Wild Rice River Watershed, Direct

Pool 4

We plan to keep this pool full after spring runoff. This will flood vegetation in the upper end and attract breeding pairs of ducks.

It may be drained into Pool 3 during the summer, to flood that pool as well as allow some revegetation in Pool 4.

Pool 3

This has been a productive marsh when newly flooded or dewatered. However, the Nickeson situation is not yet resolved. Keeping the pool only partly full is resulting in a lot of cattail. We should keep it dry in 1972 and then doze and riprap loafing-nesting islands, especially in the shallower upper part.

We hope to keep the pool from filling by passing water into Pool 2. Then, if it is dry enough, we'll doze up a number of loafing-geese nesting islands in the cattail zone and pack them with the dozer. Cattail should re-establish around them to protect them from erosion. If we are able to get these done before the brood season is over, we can drain Pool 4 into Pool 3, thus getting mud flats or shallow water in Pool 4 and making invertebrates available to ducks there. The newly flooded Pool 3 might or might not develop a bloom of invertebrates, depending on how late the season is.

Pool 2

We will have to hold this pool low enough so Pool 3 can drain dry. About 1151.00 should allow for this. The heavy growth of cattail in the upper end provides excellent cover for moulting ducks.

Pool 1

Lake Tewaukon will be held at about 1147.5. This is high enough for fishery management and recreation without excessive bank erosion.

Skroch's Bay will freeze out this winter. We hope to keep it free of large carp in the spring by fencing it off from Lake Tewaukon.

However, if we get a heavy runoff this will be impossible. This will also serve to keep the northerners in Lake Tewauckon which now run upstream and become stranded in the drainage southeast of the lake.

II. White Lake Watershed

Runoff from the T-2 or Frenier Dam is into Hepi Lake. The local runoff going into White Lakes should not be a problem.

Pool 11

There are few rough fish in the pool and it will probably winter-kill. Stoplogs will be placed and locked down at 1150.5. We want all the water we can hold in Pool 11 without flooding private land to the south. If we can go to 1151.0, we'll do that. The pool should be held high into the winter.

Pool 12

This pool is of little value to waterfowl. As it is it's a barren, open lake. We plan to dry the pool up this summer to start vegetation growing in the bottom. If needed the water will be pumped into Pool 11 to bring its elevation up to management level.

There should be only about 12 to 18" of water after the spring runoff. We'll pump all we can to Pool 11 and wait for evaporation to dry the lake up. It will revegetate with wild millet and smartweed. The shoreline grew to wild millet in 1971. We can aerial seed Japanese millet as an alternative.

If it should dry up completely, we'd like to doze up five or six loafing-nesting islands in the middle of the lake bottom and riprap them with rock from the banks.

Sand Lake Refuge expects to give us 100 large Canada geese as a nesting flock in the spring of 1973, so this would give them several nesting sites.

We plan to keep Pool 12 completely dry into the winter, and then shallowly flood it in the spring of 1973.

George Swanson, Limnologist at NPWRC, inspected the area with us and advised us on management. We would like to operate East White Lake as a seasonal wetland, nature permitting.

III. Hepi Lake Watershed

There should be enough runoff received from T-2 this spring to fill Hepi Lake so the downstream pools can be filled.

Pool 10

No water will be added from Hepi Lake. There are minnows in Hepi and we don't want to infest Pool 10 with them.

Pool 9

This dried up in 1971 but should have enough runoff to give it seasonal water. We should not fill it from Hepi Lake by use of the culvert control, for that will reinfest Pool 9 with minnows. These feed on the zooplankton in direct competition with ducks. If Pool 9 should dry up in 1972, we should keep it dry.

Pool 7A

This will be farmed in 1972 and probably flooded in the spring of 1973. Encroaching cattail and willows at the east edge should be dried out some, but will be retained because of heavy waterbird and waterfowl use there when flooded or by deer and pheasants in the winter.

Pool 7

It has declined considerably in waterfowl use since first flooded. The upper end is heavily grown to cattail. It should be dried up, the cattail burned and cultivated out, allowed to revegetate and then flooded during the spring of 1973.

Pool 6

Will be allowed to dry up some in late summer.

Pool 5

Will be allowed to dry up some in late summer.

Pool 3A

There appears to be a leak in this structure, either by the control gate not sealing or by seepage through the dike. This should be sealed and Pool 3A kept as full as we can get it. A heavy stand of emergents and an overgrown shoreline along the pool will be opened up by burning before ducks set up territories in the spring.

The cattail was sprayed with Dowpon in August 1971 and, hopefully, is dead.

Pool 2A

The dike was repaired in 1971 and the cattail sprayed. The pool should be flooded completely full and then allowed to dry up some with evaporation.

Sprague Lake Unit

Sprague Lake

As there are no controls on this lake management of the water level is not possible.

We now have two large potholes connected to Sprague Lake on the south and west by ditches with gabions to prevent carp movement and stoplog structures to regulate water flow. The flow lines of the ditches are about one foot below the culverts out of Sprague Lake to the north. We plan to fill these potholes, which were dry in 1971.

Mann Lake

This lake is directly connected with the Wild Rice River and no water controls are available for regulating lake elevations. No management of water levels will be possible in 1971.

Pool 16

This pool lies north of Mann Lake in the Hoistad-Anderson Unit recently exchanged for. No control of water levels is possible. We will attempt to establish a water gauge on it in 1971.

Potholes

Some were deepened by dozer in 1971. The spoil was too muddy to level then, but this still should be done in late summer. Also, experimental artificial type I or III potholes should be dozed where appropriate. Some small draws could be dammed to create type III potholes.

January 24, 1972

Herbert G. Troester
Refuge Manager

LAKE TITAWUKON
Average Gauge Readings

1970
1971

(Elevation Ft. -msl)

